

Nutrimate: A Pen Computer Application for Patient-Centered Nutrition Management in the Neonatal Intensive Care Unit

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Nutrition management strategies for the premature infant are patient specific and require the ongoing adjustment of intakes to achieve and maintain acceptable growth trajectories. Mini- and microcomputer-based nutrition management systems have been available for the neonatal intensive care patient for about five years. However, such systems require manual entry from nutrition charting documents, and typically are not compatible with other hospital patient data management systems, requiring duplicate data entry to make them acceptable as a basic management tool. We developed a pen-computer-based nutrition assessment system for use in neonatal intensive care which interfaces with Neonova, a widely used nutrition management system (Ross Laboratories, Columbus, OH). We implemented the system on a portable pen computer such that growth and nutrition intake (enteral, total parenteral nutrition (TPN), intravenous feeds) requirements and assessments are available and updated at the bedside to provide a 'point-of-care' utility. We selected the GRID (Fremont, CA) Palmpad and GRID Convertible computers for their portability, light weight, ruggedness and durability. GRID also supports PenPal and PenRight fourth generation language (4GL) software packages which significantly reduced application development time. Project cycle time was six months to our first beta test period. In neonatal intensive care, nutritionists complement the clinician team of physicians, nurses and therapists who manage infant growth and development. Prior to the availability of our system, nutritionists completed data collection at the bedside on a Nutrition Assessment Form (NAF) and later keypunched the data into the nutrition management system. The system then processed the data to provide a nutritional and growth summary printout. These printouts were used as the reference document during rounds. The printouts and patient NAF intake orders were updated for the next 12 to 24 hours. Next, the data was keypunched and a revised set of calculations were developed in Neonova. This process tends to be time consuming, is not patient centered nor compatible with rounding practices, and adds a significant lag between order writing and the availability of nutritional projections. Also, patient

data and order mismatch errors are highly likely. To streamline the nutritional assessment process and increase efficiency, we developed a hand-held, portable, convenient, time-saving, user-friendly nutritional assessment and documentation system, which we call Nutrimate. Nutrimate integrates with the Neonova nutrition management system, which is still used as the primary source for all nutrition calculations. We use the Palmpad for bedside data collection and patient summaries. The Palmpad uses a 1M byte PCMCIA card for data transfer to Neonova. The Convertible accommodates both the PCMCIA card and standard floppy disks for data transfer. Additionally, the Convertible can run the Neonova software simultaneously. We have developed interface software which transfers data files between Nutrimate and Neonova transparently. With the Palmpad, the nutritionist has access to the most recent orders and nutritional information for each infant in the nursery. Screen displays on Nutrimate use scrolling windows to rapidly access, view and update patient data. We evaluated Nutrimate in the University of Cincinnati Hospital Neonatal Intensive Care Unit (UHNICU) and the Regional Center for Neonatal Intensive Care (RCNIC) of the Cincinnati Children's Hospital. The average daily census of the UHNICU and the RCNIC is 50 and 40 respectively. Nutrimate displays calculated growth trajectories from Neonova to provide the clinician with this growth information at the bedside. We predicted that nutritional decision making would be more expedient using Nutrimate and that fewer data errors would occur because data are entered only once at the bedside. We observed that data collection took 19 minutes per patient, and 4 minutes for keypunching data using the old NAFs and Neonova. Nutrimate eliminates one data entry step and reduces the data collection element by eliminating the NAF, producing a daily time savings of 2 to 3 hours for each of the nurseries. This is at least a 25% reduction in the time allotted to basic data collection. We expect the availability of the nutrition information at the bedside to have a positive effect on clinician decision making. We continue to study the error reduction rate and the impact of our patient-centered system on nutrition management.